

GUIDE TO NAMING MONATOMIC IONS, BINARY IONIC COMPOUNDS, & TRANSITION METALS – SECTION 7.1

| | Definition | Steps in Creating the Formula | How Do You Name It? | Example |
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| Monatomic Ions | Ions formed from a single atom. Main group ions form to a noble gas configuration | No formulas – just ions!! Write the atomic symbol with its charge as a superscript Ca ⁺² | For cations: The elements name. For anions: The ending of the name is dropped and the ending -ide is added. | Cation: Ex. Ca is calcium; Ca ⁺² is Calcium Anion: Ex. F is flourine; F ⁻ is flouride |

Try a few examples:

- a. What do you call a sodium ion (Na⁺¹)?

- b. How would you express a sulfide ion and what charge would it have?

- c. What charge does a phosphide ion have?

- d. What charge does a potassium ion have? How would you express it?

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| Binary Ionic Compounds | Compounds composed of two elements, the total charge must be equal to zero. | 1. Write the symbols and charges of the ions side by side, cation first. $\text{Al}^{3+} \text{O}^{2-}$ 2. Cross over the charges by using the absolute value of each ion's charge as the subscript for the other ion. Make sure that the total charges now add up to zero. $\text{Al}_2^{3+} \text{O}_3^{2-}$ 3. The reason for this is so that the number of electrons that are being given by the cation can be received by the anion(s). Al_2O_3 | 1. Use the name of the cation first 2. Then use the anion name, but drop the ending and add -ide Note: You are basically just naming the monatomic ions separately and then putting them together | Al_2O_3 Aluminum Oxide |
| <p>Try a few examples:</p> <p>Write the formula for the binary ionic compounds formed between the following elements:</p> <ul style="list-style-type: none">a. Zinc and iodineb. Sodium and sulfurc. Aluminum and nitrogen <p>Name the following compounds:</p> <ul style="list-style-type: none">a. AgClb. CaCl_2 | | | | |

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| Transition Metals | D-block elements | Transition metals can have more than one charge (No formulas) | The name won't change (ex. Fe=iron=iron no matter what the charge) | PbCl ₂ Lead (II) chloride Pb(SO ₄) ₂ Lead (IV) Sulfate |
| <p>Try a few examples: (Note: I will not expect you to memorize the charges for these – you should be able to figure it out based on the charge of the negative ion or look it up on the table).</p> <p>Write the formula and give the name for the compounds that form between:</p> <ul style="list-style-type: none">a. Cu(2+) and Br (-) b. Sn(2+) and F(-) c. Hg(2+) and S(2-) <p>Name:</p> <ul style="list-style-type: none">a. CuO b. FeS | | | | |

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| Compounds containing Polyatomic Ions | Ionic compounds that use one or two positive or negative polyatomic ions to form ionic compounds Another note: Are produced by the loss of hydrogen ions (H ⁺) from oxyacids: Sulfuric acid H ₂ SO ₄ Sulfate SO ₄ ²⁻ | <i>You basically use the same steps as with putting two monatomic ions together.</i> THE TOTAL POSITIVE CHARGE WILL BALANCE THE TOTAL NEGATIVE CHARGE. Remember to treat the polyatomic ions as a package – you will NEVER change the formula of a polyatomic ion!! | <i>Same as binary ionic compounds,</i> except in this case, you won't be changing the editing of the oxyanion (it stays <i>-ate</i> , or <i>-ite</i> .) | Al ⁺³ bonding with (SO ₃) ⁻¹ Gives you Al(SO ₃) ₃ called Aluminum Sulfate |
| <p>Try a few examples: (Note: I expect you to memorize the formulas and charges of the polyatomic ions from the table on page 210 in your book).</p> <p>Write the formula for:</p> <ul style="list-style-type: none"> a. Copper (II) Sulfate b. Potassium Sulfide c. Potassium Perchlorate <p>Give the names for:</p> <ul style="list-style-type: none"> a. Ca(OH)₂ b. FeCrO₄ | | | | |

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| Molecular (Covalent) Compounds | Molecular compounds are covalently bonded units. | You will usually be given the formula and then you can find the oxidation numbers of the rest of the atoms from there, but you would normally draw the Lewis structure | Two ways: 1. The less electronegative element is given first. It is given a prefix (ex. di, tri, etc.) only if it contributes more than one atom to a molecule. <ul style="list-style-type: none"> ▪ Ex. Carbon 2. The second element is named by combining: <ul style="list-style-type: none"> ▪ a. a prefix indicating the number of atoms contributed by the element, ▪ b. the root of the name of the second element, and ▪ c. the ending <i>-ide</i>. <ul style="list-style-type: none"> ▪ Ex. Dioxide | Ex. CCl_4 Carbon Tetrachloride Ex. P_5O_2 Penta-phosphorus Dioxide |
| <p>Note: I expect you to memorize the prefixes on page 212</p> <p>Name the following:</p> <p style="margin-left: 20px;">a. SO_3</p> <p style="margin-left: 20px;">b. ICl_3</p> <p style="margin-left: 20px;">c. PBr_5</p> <p>Write the formulas for:</p> <p style="margin-left: 20px;">a. Phosphorus tetraiodide</p> <p style="margin-left: 20px;">b. Dinitrogen trioxide</p> | | | | |

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| Binary Acids | Consist of 2 elements, usually hydrogen and one of the halogens | Will always have one hydrogen bonded to a highly electronegative atom to form | To name an acid which contains a monatomic anion: <ul style="list-style-type: none"> • start the name with hydro • drop the -ide ending of the anion • add the suffix, -ic acid. | Ex. HCl Hydrochloric Acid |
| <p>Write the formula for:</p> <p style="padding-left: 40px;">a. HI</p> <p style="padding-left: 40px;">b. HF</p> | | | | |
| Oxyacids | Acids that contain hydrogen, oxygen, and a third element (usually a nonmetal). | Will always have one hydrogen bonded to a negatively charged group--likely a oxyanion (ex. NO ₃ ⁻) | If the anion ends in -ate the acid name will end as -ic. If the anion ends in -ite the acid will end as -ous. | Sulfuric acid – H ₂ SO ₄ Sulfurous acid- H ₂ SO ₃ |
| <p>Write the formula for:</p> <p style="padding-left: 40px;">a. Phosphoric acid</p> <p>Name:</p> <p style="padding-left: 40px;">a. H₂SO₄</p> | | | | |

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| Salts | An ionic compound composed of a cation and the anion from an acid. | The old definition was the product of an acid and a base reacting to form a salt and water: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ | The anion is named by adding the word <i>hydrogen</i> or the prefix <i>bi-</i> to the anion name: HCO_3^- Hydrogen carbonate ion Bicarbonate ion | Ex. NaHCO_3 Sodium bicarbonate (baking soda) |
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